

Department of Chemistry

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Prof. Joshua Lederberg,
Department of Genetics,
School of Medicine,
Stanford University,
Stanford,
California 94305,
United States of America.

Your reference

Our reference

Date

PJvV/MF

16 August 1973

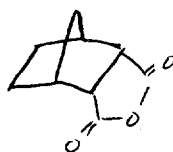
Dear Prof. Lederberg,

Thank you very much for your kind letter of May 29th requesting a copy of the lab experiment on Isomerism in Organic Chemistry. Please accept my apologies for not having been able to respond earlier to your request, as I have returned from an extensive visit to your country only recently.

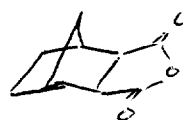
I would like to make a few comments regarding the enclosed experiment:

- i. I do believe that as far as the students are concerned, the key to the understanding of the various facets of isomerism is to be found in a logical classification of the various groups of isomers in an integrated but hierarchical fashion based on the differences in detailed structural features and/or the relative energies required to convert one of a pair of isomeric structures into the other. Such a classification is regrettably lacking in the treatment of this subject in organic textbooks - in fact, the fragmentary presentation of isomerism is probably adding towards the confusion of the student in this matter. The classification scheme at the back of page 2 represents such an attempt. Let me hasten to add that I am not at all satisfied with this scheme, although it did prove most helpful and useful in our presentation of isomerism to the students.

During this attempt, I have come to the conclusion that there still seems to be scope for incorporating new subgroups into the main group of stereo-isomerism. A typical example is represented by the exo and endo-stereo-isomers, e.g. I and II:



II



I

* provided by a student ? CEN or SCHMID ? J.C.

Ideally, these isomers should be classified as belonging to a subgroup differing only in the absolute configuration (not necessarily asymmetric) of two or more carbon atoms, being inverted with respect to each other (inverted isomers?)

I have included an alternative classification scheme as an addendum to this letter. Unfortunately, I did not have the opportunity to test the usefulness of this scheme with our students.

- ii. The assignments included in the write-up of the experiment, represent only some examples of problems to be solved by the students during the lab session. We strongly recommend that these assignments be extended, modified, excluded or new ones included in order to illustrate or emphasize the important features of the various types of isomers. I am convinced that whatever success we have enjoyed with this approach, should be largely ascribed to the flexibility of the nature of the various assignments which the students are confronted with.
- iii. A very important factor concerning the successful implementation of this lab exercise, is the extent to which the instructors or teaching assistants have familiarized themselves with the classification scheme, so as to provide individual but correct assistance to those students experiencing problems. I must admit that the first year in which we initiated this experiment, our biggest problem was our instructors not fully being able to handle the material and associated problems correctly.
- iv. We do not claim absolute success with this approach. On the whole, however, we did find that the majority of students did appear to have a better understanding of the three-dimensional nature of molecules as evidenced by the more efficient and correct use of the appropriate graphical formulae in comparison with similar attempts of students of previous years.
- v. The section on dynamic or equilibrium structural isomerism is normally not included in the write-up for our undergraduates.

Finally, since I would very much like to submit this experiment eventually to the Journal of Chemical Education, I would be most grateful if you could find the time to kindly provide some feedback on this approach. Any comments, suggestions and/or criticism which you might have, especially with regard to the alternative classification scheme, would be sincerely appreciated. As of August, I will have moved to the US and my new address will be:

Department of Chemistry,
Virginia Polytechnic Institute and State University,
Blacksburg,
Virginia 24061.

Sincerely,

Peter van Vuuren

Peter Janse-van Vuuren